Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Where feasible, mine facilities would be reclaimed in such a manner as to create new wetland areas and ponds.	Reclamation of mine facilities would minimize long-term losses of wetlands and habitat values by restoration of some wetland areas.	General	Closure	Wetlands and Other Waters/Special Aquatic Sites
Overburden removed during construction would be stockpiled for use in reclamation.	Use of native overburden during physical reclamation and closure helps promote establishment of self-sustaining native plant communities, and would eliminate the need for importing soils, thereby minimizing the introduction of invasive plant species.	General	Closure	Soils; Vegetation
Cultural resource experts would be retained during construction activities, including the offshore the offshore construction activities, to respond to any potential cultural sites identified during construction. PLP would comply with all requirements and commitments for timely reporting (and site protection) of any discoveries to the appropriate State and Federal agencies and landowners. Attachment E of the draft Programmatic Agreement (PA) (see Appendix L) contains a protocol in case of the inadvertent discovery of cultural resources, which identifies a clear chain of command for the notification of discovery, including the federal and state agencies and Consulting Parties that would be involved in notification and consultation for the discovery, review time frames, and site protection measures to be implemented in the event of a discovery.	Use of cultural experts during construction would help reduce the potential for the loss or destruction of cultural resources during construction activities through quick identification, preservation, and/or curation of artifacts.	General	Construction	Cultural Resources

Commented [A1]: Comment from BOEM: Update the mitigation to include the necessary notification / coordination with federal (e.g., BSEE, Corps, USCG) and state entities.

Commented [A2R1]: PLP to review and add more detail as appropriate.

Commented [A3R1]: PLP suggests more general language as additional requirements may be included in various ROW documents in addition to the PA. PLP agrees with the measure as edited.

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Access agreements with Alaska Native Claims Settlement Act (ANCSA) Village Corporations would include bidding and employment preferences, revenue sharing, and other benefits to enhance local employment and revenue generation.	Project use of traditional Native lands may impact other uses such as subsistence harvesting. Agreements with ANCSA corporations provide revenue to be distributed to shareholders and employment for local residents, increasing income in affected communities and regionally and offsetting potential impacts to the subsistence harvest.	General	Construction/ Operations	Needs and Welfare of the People—Socioeconomics; Environmental Justice

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
A draft Restoration Plan has been prepared outlining short-term and long-term restoration objectives for restoring temporarily impacted areas to a condition that resembles the pre-construction condition or that of adjacent lands undisturbed by the project (Owl Ridge 2019a; PLP 2019-RFI 123). Measures PLP proposes to implement to meet the restoration goal and objectives include: • Minimize construction impacts on temporary work areas by preserving the native vegetation root mass where practical and safe. • Use proper soil management techniques, including stripping, stockpiling, and reapplying topsoil to establish surface conditions that would enhance the development of diverse, stable, and self-generating native plant communities. • Establish stable surface and drainage conditions with the use of erosion control measures as needed to minimize soil erosion and off-site sedimentation. • Re-establish terrain elevations that blend with the surrounding landscape. • Establish a permanent plant cover of native shrubs and grasses. • Use certified seed (11 Alaska Administrative Code [AAC] 34.075) mixtures as suggested in the Alaska revegetation and erosion control guides. • Clean up trash or other construction debris (e.g., flagging, survey lath, plastics). • Monitor during and after construction phases to ensure the achievement of short- and long-term restoration objectives.	A restoration plan helps ensure that habitat loss associated with construction activities is temporary and that impacted areas are appropriately restored to their pre-construction conditions.	General	Construction	Wetlands and Other Waters/Special Aquatic Sites; Soils; Vegetation; Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
A draft Reclamation and Closure Plan (RCP) has been prepared (SRK 2019d; PLP 2019-RFI 115) and a final RCP would be developed during feasibility design work to support state permitting. The RCP would be updated on a regular basis and regular site compliance audits would be conducted as required by state regulations. The project would fully bond for reclamation and closure costs before commencing construction and the bonding amounts would be updated on a regular basis to address any changes. The final RCP would document the plan for long-term closure of the site in a stable condition in compliance with all applicable closure criteria and regulations; and would serve as the basis for the development of the closure cost estimate and associated bonding.	An RCP ensures that state reclamation and closure objectives are met, including long-term environmental management, and that financial assurances are in place to ensure an orderly and stable closure. The RCP and bonding would also minimize potential future financial effects on the land owner, and reduce the likelihood and extent of impacts on downstream water and sediment quality through long-term contact water capture, treatment, and discharge.	General	Construction/ Operations/ Closure	Land Ownership, Management and Use; Health and Safety; Water and Sediment Quality
The project would establish a local advisory committee to facilitate communications and address concerns during construction and operations.	Good communication and coordination with residents and local service providers help to mitigate operational impacts such as road traffic and address community safety concerns.	General	Construction/ Operations/ Closure	Transportation and Navigation; Subsistence; Environmental Justice
The project would provide for controlled use of the road corridor and ferry for local residents, improving the supply of goods and reducing the cost of importing goods. Controlled use could include scheduled convoys for the transport of private vehicles and supplies, qualification and limited use authorization of third-party vehicles and drivers using the access infrastructure, or other similar arrangements.	Use of the transportation corridor for the supply of goods to local communities can help reduce the cost of living in those areas.	General	Construction/ Operations/ Closure	Transportation and Navigation; Needs and Welfare of the People—Socioeconomics; Environmental Justice
The project would implement workforce development programs and training to prepare local residents for employment at the project.	Training programs help local residents obtain employment with the project, which increases income in the region, and also helps to stop out-migration and school closures.	General	Construction/ Operations/ Closure	Needs and Welfare of the People—Socioeconomics; Environmental Justice

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The project would have a no hunting, fishing, or gathering policy for non-local employees. This would prevent additional competition for local resources.	A policy of no hunting, fishing, or gathering for non-local employees prevents additional competition for local subsistence resources.	General	Construction/ Operations/ Closure	Subsistence; Commercial and Recreational Fisheries;; Environmental Justice
A conceptual Fugitive Dust Control Plan (FDCP) has been prepared to identify project design features and best management practices (BMPs) that would be implemented to minimize fugitive dust emissions (PLP 2019 – RFI 134). Detailed implementation plans would be developed based on final project designs and permit conditions and the FDCP would be updated, as required, to support state permitting. This would include establishing a requirement for the development and implementation of an industry standard operations and maintenance plan prior to construction that would identify specific dust control measures, implementation triggers, equipment specific requirements, individual responsibilities and contact details, training requirements, and other measures. The objective of the FDCP is to reduce the potential for airborne dust and control fugitive dust emissions from the activities associated with the construction, operations, and closure of the mine.	Implementation of the FDCP would help minimize potential adverse effects to the nearby environment, prevent public nuisance from airborne dust, and promote a healthy work environment for project staff. Within the limits of its regulatory authority, ADEC can require an assessment of ambient air quality to verify whether fugitive dust is causing or significantly contributing to concentrations of particulate matter above ambient air standards.	General	Construction/ Operations/ Closure	Air Quality; Water and Sediment Quality; Fish Values; Soils; Health and Safety

Commented [A4]: EPA comment: Consistent with CEQ guidance on NEPA and mitigation, to improve the effectiveness of the dust control plan, we recommend that the dust control plan state that an operations and maintenance plan will be developed and implemented prior to construction. The O&M plan should include key aspects such as: 1) More stringent commitments regarding implementation; 2) Set cut points for plan activation (e.g., after x days without rain/snow, or upon detection of dust plumes); 3) An indication of when the filter baghouse would be operated (e.g., year round); 4) A list of staff positions responsible for each measure, and a way to contact them. (this would appropriately include a list of staff positions that can trigger a dust control measure); and 5) A specific list of training (e.g., who gets trained, and to what level).

Commented [A5R4]: Added to Appendix M1.0. PLP to advise if they are willing to adopt measure.

Commented [A6R4]: PLP agrees with the measure as edited.

Commented [A7]: Added to address SOA comment.

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
A Wildlife Interaction Plan would be developed and implemented to minimize human-wildlife interactions and resolve any potential conflicts. The goal of the plan would be to prevent problems resulting from human-wildlife interactions to a manageable and acceptable level and to ensure that wildlife can continue to thrive in the project area. This plan would be managed through an adaptive management approach. Wildlife report sightings and interactions reported would be used to assess the effectiveness of mitigation measures or guide project personnel in the establishment of additional mitigation measures as required. This plan would describe education and training for project personnel and contractors, control measures to avoid and minimize human-wildlife interactions deterrence and hazing procedures for reporting wildlife sightings and interactions, and an adaptive management approach. Specific wildlife safety mitigation measures and design features proposed for the Amakdedori port and transportation corridor are outlined in response to RFI 122 (PLP 2019-RFI 122).	Implementation of a Wildlife Interaction Plan would help minimize human-wildlife conflicts. Incorporation of adaptive management would help resolve and avoid potential conflicts that are identified as the project advances.	General	Construction Operations/ Closure	Wildlife Values

Commented [A8]: ADF&G comment: A detailed Bear Interaction Plan designed to minimize conflicts between bears and humans needs to be part of PLP's Wildlife Interaction Plan. PLP needs to coordinate development of this plan with ADF&G staff.

Example plans have previously been provided to PLP. But no PLP draft plans have been provided or noted within the Wildlife Interaction Plan.

At a minimum the plan should include measures to:
A. minimize attraction of bears to facility sites;
B. organize layout of buildings and work areas to minimize interactions between humans and bears;
C. warn personnel of bears near or on facilities and the proper actions to take;
D. if authorized, deter bears from facility sites;
E. provide contingencies in the event bears do not leave the site;
F. provide for the proper storage and disposal of food, garbage or other industrial materials that may be attractants to bears;
G. provide for the proper storage and disposal of materials that may be toxic to bears;
H. provide a systematic record of bears on the site and in the immediate area: and
I. additional measures as developed in consultation with ADF&G.

Commented [A9R8]: This measure was added to App M1.0

Commented [A10R8]: PLP to consider this as part of the wildlife interaction plan.

Commented [A11R8]: PLP agrees with the measure

Specific wildlife safety mitigation measures and design features proposed for the Amakdedori port, and transportation corridor, and food and garbage management are outlined in response to RFI 122 (PLP 2019-RFI 122). All measures from RFI 122 would be incorporated into the project's Wildlife Interaction Plan. Examples include: Amakdedori Port Wildlife Safety Mitigation: • The port facility would be fenced-in using chain-link fences and possible electrical fences. The road entrance would have a gate and the fence would extend onto the causeway as needed to limit access from the intertidal zone. • Secure bear-resistant storage would be used for handling food and garbage. • Food would be kept inside buildings and only permitted inside vehicles for short periods, when workers are unable to use the dining facilities. Food and garbage would be disposed of in dedicated trash containers at each site, and routinely emptied to limit buildup of odors that could attract wildlife. Transportation Corridor Wildlife Safety Mitigation: • Wildlife present on the road would be given the right-of-way. Traffic would stop, if necessary, to allow the safe passage of wildlife (e.g. a bear or moose crossing, or walking along, the road). • The maximum speed limit for the road system would be set at 35 miles per hour. Speed limits would be reduced as required in areas of high seasonal wildlife usage and at known crossing points. Vehicle speeds would be posted along the road and all drivers would be monitored using mobile GPS fleet tracking technology to ensure compliance. • As practical snowbank height during the winter would be minimized to increase driver visibility. • Any wildlife injuries or mortalities would be immediately reported as appropriate. The carcasses of any road-killed animals would be removed and disposed of in a timely manner so	implementation of measures outlined in PLP 2019-RFI 122 would help minimize human-wildlife conflicts.	General	Construction Operations/ Closure	Wildlife Values

Commented [A12]: PLP to confirm.

Commented [A13]: This commitment would not be fully compatible with the port design under Alternative 3 and should be considered specific to Amakdedori Port.

Commented [A14]: Per SOA they want this changed to bear-proof

Commented [A15R14]: Added a measure for use of bear-proof containers to App M1.0.

Commented [A16R14]: PLP

Commented [A17R14]: PLP agrees with the measure

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
that they do not serve as an attractant to bears or other wildlife. PLP will coordinate with ADF&G on the salvage of fresh useable game species for community food. Food and Garbage Management: • Feeding and attracting of wildlife by project personnel will be prohibited. • Food will be kept inside buildings and only permitted inside vehicles for short periods, when workers are unable to use the dining facilities. Food and garbage will be disposed of in dedicated trash containers at each site, and routinely emptied to limit buildup of odors that could attract wildlife. • Trash containers inside fenced areas will be located away from the fence line to minimize wildlife attractions • Any food wastes that could attract wildlife will be temporarily stored in enclosed containers, and periodically backhauled to the mine site for incineration and disposal.				
The project would employ protocols to ensure that helicopters and fixed-wing planes do not harass wildlife. These protocols, listed below, would remain in place throughout construction and the life of the mine. • Do not harass or pursue wildlife. • Fly 500 feet above ground level or higher when possible and safe to do so. • When wildlife (especially bears, caribou, moose, wolves, raptor nests, flocks of waterfowl, seabirds, or marine mammals) are observed, avoid flying directly overhead and maximize lateral distance ~~as quickly as possible~~.	Established protocols for operators of helicopters and fixed-wing planes being used for the project would minimize disturbance to wildlife.	General	Construction/ Operations/ Closure	Wildlife Values

Commented [A18]: Comment from SOA: Mitigation measure should include coordinated communications with ADF&G or local law enforcement in order to salvage fresh useable game species for community food.

Commented [A19R18]: PLP

Commented [A20R18]: PLP has added to the commitment as requested.

Commented [A21]: Redlines from SOA comment

SOA comment: text should be reworded. Disturbance response in many species of wildlife is caused by sudden changes in engine noise which can be caused by sudden changes in direction or acceleration. Additionally, flying above 1,500 ft will likely prevent disturbance to most species.

Commented [A22R21]: PLP agrees with the measure

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
PLP prepared an Invasive Species Management Plan (ISMP) project (PLP 2019–RFI 133). PLP would implement the ISMP through training and communicating with project personnel and contractors throughout the life of the project, including during planning, construction, operations, reclamation, and closure. The goal of the ISMP is to prevent, minimize, and control the spread of invasive species. It includes training requirements, development of a hazard analysis and critical control point (HACCP) plan prior to construction, prevention measures, early detection and rapid response (EDRR), and control treatment options.	Implementation of the ISMP and use of BMPs for the prevention, control, and management of invasive species would eliminate or minimize opportunities for introducing invasive species to the project area, and prevent their spread if detected in the project area.	General	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites; Fish Values; Wildlife Values
An Aquatic Resources Monitoring Plan (ARMP) would be developed for the project. The ARMP would be developed in consultation with the Alaska Department of Fish and Game (ADF&G) and ADNR as part of the plans of operation during state permitting. The ARMP would assess the effects of mine operations on aquatic habitats and verify, through biomonitoring, that waste management control measures at the mine site are protective to the aquatic environment. ARMP elements would be applicable to all project phases. The elements of the ARMP are described in the response to RFI 135 (PLP 2019-RFI 135).	Implementation of an ARMP with the objective of monitoring for change to aquatic communities would allow for adaptive management to address any project-related impacts.	General	Construction/ Operations/ Closure	Wetlands and Other Waters/Special Aquatic Sites; Fish Values; Water and Sediment Quality

Commented [A23]: SOA Comment: Guidelines for prevention of invasive species introduction during project revegetation activities should be incorporated into the project's Invasive Species Management Plan.

Commented [A24R23]: This comment was made in reference to a measure in App M1.0 regarding streambank restoration incorporating bioengineering techniques.

Commented [A25R23]: PLP

Commented [A26R23]: PLP will adopt the measure

Commented [A27]: EPA comment: We recommend that the Monitoring and Adaptive Management Plan (particularly Sections 3.1 and 3.4) identify how the monitoring could be used to assess impacts from the authorized discharges or from an exceedance of a discharge criteria. We also recommend providing additional detail in Table 5-2 of the FEIS that defines how project impacts would be quickly identified and reduced through adaptive management and which regulatory agency/permit would require this.

Commented [A28R27]: Added measure to App M1.0. PLP to advise if they are willing to adopt measure.

Commented [A29R27]: PLP will adopt the measure

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The project's water management strategy is based on the managed release of surplus water to maximize downstream fish habitat in areas impacted by flow reductions resulting from mine construction. Details are available in the PHABSIM modeling reports (PLP 2019-RFI 147 and PLP 2019-RFI 149 [R2 Resource Consultants 2019a]), the watershed modeling reports (PLP 2019-RFI 109f), and the Water Balance and Water Quality Model Report (PLP 2019-RFI 021g), which collectively outline the project's water management strategy. PLP is proposing to replace damaged fish passage culverts to reopen access to anadromous fish habitat in other areas as part of its Compensatory Mitigation Plan. Additional culvert replacement, or other habitat access enhancement strategies, may be proposed as mitigation during state permitting of fish habitat impacts.	Enhancement of existing habitat through flow management and restoration of access to fish habitat would help compensate for long-term losses of fish habitat in the project footprint.	General	Construction/ Operations/ Closure	Wetlands and Other Waters/Special Aquatic Sites; Fish Values
A Cultural Resources Management Plan (CRMP) would be developed for the project as part of the Section 106 consultation process and as dictated by the draft ~~Programmatic Agreement (~~PA~~)~~. The draft PA lays out the methods for identifying and consulting on the mitigation of adverse effects to historic properties and outlines what must be included in the CRMP, which would include details on how to carry out the mitigation measures. The CRMP would describe the equipment, methodology, training, and assessment techniques that would be used to manage historic properties on state and private lands impacted by the project. The plan would describe the process for managing effects to these resources, and ensure that agreed-on protocols and procedures are established and followed if any unanticipated cultural resources or human remains are discovered.	A CRMP would reduce the impacts to cultural resources by providing specific procedures for handling unanticipated cultural resources if discovered.	General	Construction/ Operations/ Closure	Cultural Resources; Historic Properties

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
A Project Communications Plan (PCP) would be developed for the project prior to construction commencement. The PCP would establish the methodology and infrastructure that would be used to keep local residents, guides, and other users informed about upcoming and ongoing activity.	Good communication with residents and local service providers is important for coordinating operations and minimizing safety concerns.	General	Construction/ Operations/ Closure	Recreation; Subsistence; Transportation and Navigation; Recreational and Commercial Fisheries
Drug and Alcohol Abuse Prevention, Cultural Sensitivity, Safety, and other workplace programs would be developed for all employees. The programs would be designed to provide employees with the training and resources needed to allow for a safe, healthy, and conflict-free workplace. These programs would be implemented for all project staff and contractors prior to construction commencement.	Workplace programs allow for safe and healthy workplaces, while creating a culture of cultural sensitivity and conflict management.	General	Construction/ Operations/ Closure	Needs and Welfare of the People—Socioeconomics; Health and Safety
The project would develop a Storm Water Pollution Prevention (SWPPP) and follow BMPs for stormwater management. The SWPPP would describe the BMPs (equipment, methodology, training, and assessment techniques) that would be used for the management of stormwater on the project, in compliance with state and federal requirements, to minimize the transfer of sediment and other pollutants in stormwater associated with project activities. The SWPPP would be developed during detailed design, and would be in place prior to construction commencement.	Development of an SWPPP would provide approved processes for managing stormwater runoff, and thereby reduce the potential for impacts to surface water and sediment quality.	General	Construction/ Operations/ Closure	Water and Sediment Quality
The project would develop an Erosion and Sediment Control Plans (ESCP) and follow BMPs for erosion and sediment control. The ESCP would describe the BMPs (equipment, methodology, training, and assessment techniques) that would be used to minimize erosion and sedimentation associated with project activities. The ESCP would be developed during detailed design, and would be in place prior to construction commencement.	Development of an ESCP would provide processes for managing erosion and sedimentation, and thereby reduce the potential for impacts to surface water and sediment quality.	General	Construction/ Operations/ Closure	Soils; Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
If emissions remain high enough to trigger Prevention of Significant Deterioration (PSD) permitting, a Best Available Control Technology (BACT) analysis would be completed for the mine site as part of the State's air permitting program. BACT would be implemented for emissions sources as required by the BACT analysis.	A BACT analysis would ensure, through the air permitting program, that the project design would incorporate the best available technology that could result in the reduction of project-related air pollutants (emissions). This would support the mitigation of impacts to air quality from project-related emissions.	Mine Site	Construction/ Operations/ Closure	Air Quality
Design features for the avoidance and minimization of spills would include specialized tanks/containers for the storage and transport of diesel and concentrate; locking mechanisms on concentrate container lids; the use of ice-rated vessels for transportation as required for winter operations; the use of double hulled fuel barges for fuel transport; and the implementation of a ~~gas~~ pipeline leak detection systems for the gas, concentrate, and return water pipelines.	Design features would aid in the avoidance and minimization of potential spills and resulting adverse effects.	General	Construction/ Operations/ Closure	Health and Safety; Spill Risk
Operational measures for preparedness, prevention, response, and the natural gas pipeline would be implemented as described in the response to RFI 126 (PLP 2019-RFI 126).	Implementation of the operational measures described in the response to RFI 126 would avoid and minimize the occurrence and the potential adverse effects of spills.	General	Construction/ Operations/ Closure	Health and Safety; Spill Risk
Secondary containment would be used for all fuel and hazardous chemical storage, and the project would use BMPs for the handling of fuel and hazardous materials.	Use of secondary containment around fuel and chemical storage areas would reduce the risk of an uncontrolled release of contaminants to the environment.	General	Operations	Health and Safety; Spill Risk
The project would contract with a Spill Response Organization (e.g., Alaska Chadux Corporation) to provide on-call response services, and would also stockpile spill response equipment at all appropriate locations.	Ready access to a response organization and prepositioned equipment would reduce the response time and minimize the environmental effect of spills, should they occur.	General	Construction/ Operations/ Closure	Spill Risk

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The project would offer to negotiate a Payment in Lieu of Taxes (PILT) to the Lake and Peninsula Borough (LPB) as an alternative to the borough severance tax, to allow for predictability in annual revenues.	The project may result in additional costs accruing to the LPB as a result of project activities and additional municipal and school district costs as a result of reduced outflow from the region due to additional employment opportunities. Severance taxes would offset the cost of these requirements, but can vary from year to year, resulting in unpredictable budgets for the Borough. A PILT negotiation allows for predictability in annual borough revenues, which supports local government services and enhances the quality of life for residents in the region.	General	Operations	Needs and Welfare of the People—Socioeconomics, Environmental Justice
A shift schedule would be established to enable local employees to maximize opportunities to remain active in subsistence harvest activities.	A shift schedule allows employees to participate in subsistence activities, many of which require long periods of uninterrupted time.	General	Operations	Subsistence; Needs and Welfare of the People—Socioeconomics; Environmental Justice
The use of natural gas and a combined-cycle power plant to generate power would reduce air impacts and remove the need to transport large amounts of diesel fuel.	Using natural gas instead of diesel for power generation reduces air emissions and the risk of diesel spills.	General	Operations/ Closure	Air Quality; Transportation and Navigation

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The natural gas pipeline design has been oversized to allow for regional access to gas, which could reduce regional power costs and dependence on diesel fuel shipments. PLP would engage with~~The~~ state and/or local governments would have the about options to continue operation of the pipeline when it is no longer required by the project.	High energy costs are a limiting factor of the quality of life in communities adjacent to the region. The widespread use of diesel for power generation has resulted in impacts to waters from spills and to air from emissions. Community access to natural gas would reduce the cost of power, reduce the potential for fuel spills, and improve air quality in the region.	General	Operations/ Closure	Needs and Welfare of the People—Socioeconomics; Environmental Justice; Health and Safety; Spills; Water and Sediment Quality; Air Quality
Blasting during construction would be done following the guidelines established in the 2013 ADF&G Technical Report (No. 13-03) Alaska Blasting Standard for the Proper Protection of Fish (Timothy 2013).	Following the BMPs and methods outlined in this report would help minimize impacts to fish from blasting in or near fish-bearing waterbodies.	General	Construction	Fish Values
A periodic third-party audit of the Pebble Mine facility would be completed as part of the state permitting program. The purpose of the facility audit would be to verify compliance with applicable environmental laws associated with the Reclamation Plan Approval and Integrated Waste Management Permit, if issued, by evaluating both PLP's management and state permit administration for reasonable assurances that the facility and environmental controls are functioning as intended. The environmental audit would include an evaluation of the adequacy of the approved financial assurance.	This measure does not mitigate a specific impact but would allow for adaptive management if the audit finds that the facility and environmental controls are not functioning as intended.	General	Operations	Health and Safety; Spills; Water and Sediment Quality
The construction area (temporary disturbance footprint) associated with the project would be marked, using flagging or other methods, prior to any brush clearing and construction activities (PLP 2019–RFI 071b).	Clear marking of the construction area would minimize the potential for disturbance to soils, vegetation, and wetlands outside the permitted work area.	General	Construction	Wetlands and Other Waters/Special Aquatic Sites

Commented [A30]: USACE comment: Vague as to how pipeline operations would continue. State under what authority pipeline operations could continue.

Commented [A31R30]: Edited for PLP action rather than state/local government action.

Commented [A32R30]: PLP to review

Commented [A33R30]: PLP agrees with the edit

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The main water management pond (WMP) is proposed to be a fully lined facility, with the embankment constructed on competent bedrock and an overall downstream slope of approximately 2H:1V and an overall upstream slope of 3H:1V. In addition to the geomembrane liner, the embankment would include a filter/transition (F/T) zone. The basin and upstream embankment face would include a layer of materials above the liner to provide ice protection during freezing conditions. (PLP 2018-RFI 101)	The main WMP design minimizes instability risks associated with potential undetected weak foundation conditions	Mine Site	Design/ Construction	Geohazards and Seismic Conditions
PLP would establish an independent engineering review panel to review the design, construction, operation, and closure of the tailings and water storage facilities. Such panels typically meet multiple times a year during design and construction to review progress with the design and construction team and annually or biannually during operations with additional meetings if required. The panel prepares a report of each meeting with its conclusions, recommendations, and ongoing comment register for use by the project owner.	Independent review of embankment planning, design, construction, and operations by dam and tailings experts helps identify potential weaknesses that lead to design, construction, and operations improvements; address closure and post-closure considerations; and minimize the risk of dam failure and tailings and water spills.	Mine Site	Design/ Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk; Groundwater Hydrology; Surface Water Hydrology
A trade-off study would be completed in detailed design to determine the preferred closure cover system for the bulk TSF, which would include an evaluation of cover material efficacy, longevity, and maintenance requirements (PLP 2019-RFI 130).	The cover design and long-term performance have implications for reducing infiltration and seepage and enhancing stability of the embankment in post-closure.	Mine Site	Closure	Geohazards and Seismic Conditions; Groundwater Hydrology; Water and Sediment Quality; Spill Risk

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Dry closure of the bulk tailings storage facility (TSF) would be implemented to reduce both the likelihood and consequence of potential TSF failure post-closure. - This would be achieved by removing the pond, promoting runoff, limiting infiltration, and allowing for consolidation and long-term internal drainage of the tailings. - Stability and seepage analyses specific to closure conditions would be completed during detailed closure design and updated throughout the latter stages of operations, and would be reviewed by the independent engineering review panel. - If required to achieve drainage and stability goals (maintaining reduced phreatic surface and pore pressures at the embankments), alternative drainage-enhancing features would be considered, such as vertical or horizontal drains (PLP 2019-RFI 130).	Dry closure would eventually result in a stable landform for the bulk tailings, reducing the potential for dam failure and the resulting safety and environmental impacts.	Mine Site	Operations/ Closure	Spill Risk; Water and Sediment Quality; Geohazards and Seismic Conditions
In post-closure, the pit lake would be maintained at a level that promotes long-term hydraulic containment of pit water, protecting site and regional groundwater quality.	Maintaining a groundwater sink would control the flow of groundwater out of the mine site area, and allow for water to be captured and treated prior to discharge.	Mine Site	Closure	Surface Water Hydrology; Groundwater Hydrology; Water and Sediment Quality
The pit lake would be maintained at a level that allows for an inward flow of groundwater while providing for additional storage capacity to allow for treatment downtime due to water treatment plant maintenance or other problems, without over-topping.	Maintaining a buffer in containment capacity, while ensuring maintenance of a groundwater sink, would allow for unplanned operational interruption.	Mine Site	Closure	Surface Water Hydrology; Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Both TSF locations and mine facility locations were selected to minimize impacts to spawning habitat in the middle reaches of the South Fork Koktuli (SFK) and Upper Talarik Creek (UTC) watersheds.	The siting of the TSFs and mine facilities minimize impacts to spawning habitat in the middle reaches of the SFK and UTC watersheds.	Mine Site	Construction/ Operations/ Closure	Fish Values
The layout was designed to consolidate the majority of the site infrastructure in a single drainage, the North Fork Koktuli, and avoid the placement of waste rock, tailings, and primary mine infrastructure in the UTC drainage.	Limiting the affected footprint of the mine site would reduce the geographic extent of impacts.	Mine Site	Construction/ Operations/ Closure	Surface Water Hydrology
The project would use only non-pit quarried rock, or non–acid-generating (NAG) pit waste that is confirmed not to be neutral metal leaching, in site construction. PLP has determined from the characterization of quarry materials planned for use in construction that they contain negligible sulfide minerals, are NAG, and contain trace element contents at levels comparable to globally typical values for unmineralized rock. PLP's primary approach to selecting rock that achieves the objective of meeting water quality criteria for metals and other parameters without treatment of runoff in perpetuity is to source construction materials from the quarries and test the rock operationally to confirm sulfur and element characteristics. During operations, PLP would assume that all waste rock from the pit requires management in the pyritic TSF unless test work (blast hole, drill core, and pit face sampling) and geologic mapping demonstrate that the rock is not potentially acid generating and/or metal leaching and can safely be segregated from the PAG/metal leaching waste rock for use in project construction activities. The State of Alaska would require the final determination of site-specific neutralization potential (NP)/acid-generating potential (AP) ratio used for separation of rock material to be determined in coordination with the State during the permitting process.	Confirmation and use of NAG material in construction would reduce the risk of impacts to water and sediment quality from acid rock drainage (ARD).	Mine Site	Construction/ Operations/ Closure	Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The project design uses flattened TSF downstream slopes of 2.6 horizontal:1 vertical to improve PLP's proposed static factor of safety (1.9) beyond the industry norm of 1.5.	Use of flatter slopes on the TSF embankment would increase the factor of safety and reduce the risk of a failure.	Mine Site	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk
Additional geotechnical investigations and detailed assessment of embankment foundation conditions would be completed as design progresses to support refinements of stability and seepage analyses. Future programs would include additional investigation along embankment alignments to further evaluate their location relative to faults, clays, or other weak zones. Potential weak foundation materials or conditions would be mitigated by detailed stability analyses to determine their effect on embankment stability, removal of the materials, or flattening of downstream slopes if required (PLP 2018-RFI 008a; PLP 2019-RFI 006c, 008g, 014b).	Site-specific evaluation of foundation conditions informs stability and seepage analyses and detailed design, and reduces risks to embankment stability and groundwater quality.	Mine Site	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk; Water and Sediment Quality
Additional tailings and filter/transition materials testing would be conducted as design progresses, and the results used to validate the bulk TSF seepage analysis and confirm the phreatic surface used in the stability analyses. The additional tailings test work would include index testing (materials classification), slurry settling, air drying, and consolidation, permeability, and strength testing. Durability testing of F/T zone materials would be completed to confirm their suitability for controlling drainage and material migration (PLP 2019-RFI 008h). Refined seepage analyses in detailed design would consider the additional tailings testing, the plan for tailings discharge (e.g., spacing of spigots, discharge time from each point), and a range of sensitivity analyses (PLP 2019-RFI 006c).	Site-specific evaluation of tailings and embankment materials and refined seepage analyses inform the stability analyses and water balance modeling, and reduce risks to embankment stability and water management and treatment.	Mine Site	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk; Surface Water Hydrology; Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Seismic hazard analyses that predict ground-shaking effects on mine site embankments would be updated in final design, incorporating updated ground motion data and models, and using acceleration time-history records from past earthquakes to model deformation from different types of maximum credible earthquakes (MCEs) (PLP 2018-RFI 008c, PLP 2019-RFI 008h).	Incorporation of updated ground motion models into embankment design reduces seismic risk to embankment stability.	Mine Site	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk
Detailed seismic stability and deformation modeling of mine site embankments, including the use of numerical modeling techniques, would be completed during a later design phase to better define embankment displacements in an earthquake (PLP 2018-RFI 008a; PLP 2019-RFI 008g, 008h).	Use of numerical modeling techniques allows refinement of embankment and F/T zone design and reduces seismic risk to embankment stability.	Mine Site	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk
The recency of activity and location of Lake Clark fault splays with respect to mine site structures would continue to be investigated as design progresses, which may include field studies and the examination of additional light detection and ranging (LiDAR) and high-resolution aeromagnetic data in collaboration with Alaska DGGS and USGS (Knight Piésold 2019d; PLP 2019-RFI 139).	The distance and maximum earthquake assigned to faults inform ground shaking predictions, which are incorporated into embankment design so that they withstand impacts from a major earthquake.	Mine Site	Operations	Geohazards and Seismic Conditions; Spill Risk
Piezometers would be installed in the bulk TSF tailings mass to monitor pore pressures during fill placement, and trigger levels established to monitor the development and dissipation of pore pressures during construction. If excess pore pressures develop adjacent to the upstream edge of the centerline portion of the embankment, fill placement procedures may be modified or stopped in certain locations to allow pore pressures to dissipate (PLP 2019-RFI 008g, 008h).	Embankment stability relies on the control of water levels and pore pressures adjacent to the upstream edge of the embankment to reduce the load on the embankment.	Mine Site	Construction/ Operations	Geohazards and Seismic Conditions; Spill Risk

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
An operations, maintenance, and surveillance (OMS) manual would outline maintenance and monitoring requirements for the bulk TSF and would be continually updated as required throughout operations and closure. An emergency action plan would be defined as part of the OMS manual that would include maximum operating pond levels for the TSFs and a response plan to be implemented (e.g., adding pumping capacity to reclaim systems, temporarily reducing or stopping tailings discharges) if water levels exceed defined maximum operating levels (PLP 2019-RFI 008h).	Embankment stability relies on the control of water levels to prevent overtopping and high pore pressures in embankment materials.	Mine Site	Operations	Geohazards and Seismic Conditions; Spill Risk; Surface Water Hydrology
Long-term monitoring of embankment stability in post-closure would include ongoing surface runoff and seepage monitoring, regular cover inspections, annual dam safety inspections, and inspections conducted in response to specific events (e.g. earthquakes, large storms) (PLP 2019-RFI 130).	Long-term monitoring would minimize the effects of precipitation, seepage, and earthquakes on embankment stability.	Mine Site	Closure	Geohazards and Seismic Conditions; Spill Risk; Surface Water Hydrology
BMPs and design guidelines would incorporate avian protection for all powerlines.	Incorporation of standard BMPs and design guidelines for powerlines would minimize avian impacts.	Mine Site	Construction/ Operations/ Closure	Wildlife Values
Construction laydown areas would be reused as material stockpiles or other storage facilities to minimize project footprint.	Reduces wetlands and vegetation impacts.	Mine Site	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites
Two separate operations water treatment plants (WTPs) are proposed to avoid co-mingling mine water and contact water, and optimize treated water quality.	Design and use of multiple WTPs would provide increased efficiency, reduced risk of treatment failure, and an increase in the capacity to manage unplanned interruption in operation or unexpected flow increases.	Mine Site	Operations/ Closure	Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
During closure and post-closure, equipment and personnel would be maintained at the mine site to support ongoing water treatment, maintenance, and monitoring activities. Redundant mechanical equipment would be stored onsite and available if any repairs are required (PLP 2019-RFI 130).	Onsite personnel and redundancies in equipment throughout post-closure reduce the risk of a contact release to the environment in the event of an upset condition such as a pump or reclaim pipeline failure.	Mine Site	Closure	Water and Sediment Quality; Spill Risk; Fish Values
Excess site water would be treated and released into the Upper Talarik, North Fork Koktuli, and South Fork Koktuli watersheds. Discharge water would be distributed between the three watersheds in a way that optimizes water levels and thereby available downstream fish habitat based on PHABSIM modeling of the three watersheds in consultation with Alaska Department of Fish and Game.	Minimizes impacts to fish habitat in downstream areas affected by mine-related flow reductions.	Mine Site	Operations	Fish Values
The project would use pit blasting techniques that minimize the amount of explosives per delay, thereby reducing the overall vibration associated with the blast.	Modifications to the blasting process that reduce vibrations would in turn reduce noise effects.	Mine Site	Operations	Noise
Mining only near surface portions of the deposit reduces strip ratio and eliminates the need for a permanent waste rock storage facility.	Near-surface mining minimizes the permanent footprint and potential waste rock effects on water quality.	Mine Site	Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites; Water and Sediment Quality
Storage of all potentially acid-generating (PAG) and/or metal leaching waste rock in the pyritic TSF and placement of that waste rock back into the open pit at closure improves the site post-closure surface and groundwater quality by removing the requirement for perpetual management of runoff and seepage resulting from a separate aboveground waste rock storage facility. (The open pit would require long-term monitoring and treatment and discharge of water with or without the PAG waste rock.)	Storage of PAG materials in a subaqueous environment during operations and closure would minimize oxidation and acid generation, thereby reducing the potential for development of ARD.	Mine Site	Operations/ Closure	Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Segregation of bulk and pyritic tails and placement of pyritic tails back into the open pit at closure improves the site post-closure surface and groundwater quality by removing the need for perpetual management of seepage from the pyritic TSF, and also removes any potential for post-closure failure of the pyritic TSF. (The open pit would require long-term monitoring and treatment and discharge of water with or without the pyritic tails.)	Final storage of PAG materials in a subaqueous environment would minimize oxidation and acid generation, thereby reducing the potential for development of ARD and removing the potential for embankment failure.	Mine Site	Operations/ Closure	Water and Sediment Quality
The pyritic TSF would be a fully lined facility to minimize water quality impacts during operations and facilitate closure by allowing the complete recovery of pyritic tailings for placement back into the open pit.	Placement of a liner below the pyritic TSF would minimize potential impacts on underlying groundwater quality.	Mine Site	Operations/ Closure	Water and Sediment Quality
Liner material specifications for the pyritic TSF and main WMP would be finalized in detailed design, and current industry standard QA/QC monitoring would be used during installation (Knight Piésold 2018b; Piteau Associates 2018a).	Liner selection and installation monitoring would minimize the potential for seepage from defects.	Mine Site	Operations	Water and Sediment Quality; Groundwater Hydrology
The bulk TSF would be designed as a flow-through facility, reducing pore pressures and allowing for improved tailings consolidation, reducing the impacts of a potential TSF failure. Details of filter/transition zone gradations, design flow capacity for underdrains, and QA/QC plans for construction would be developed during detailed design. Operational practices to manage tailings segregation, promote beach development and maintain minimum beach widths, and prevent plugging and hindrance of seepage flow out of the bulk TSF would be identified in a tailings deposition plan included in an OMS manual prior to operations (PLP 2018-RFI 006, 006a; PLP 2019-RFI 006c, 008g).	Reduction of pore water in the tailings impoundment would aid in the development of a more stable landform. Filter and transition zone design specifications and placement of coarse tailings near the embankment are important for reducing the phreatic surface and the risk of internal erosion, and avoiding impacts to embankment stability.	Mine Site	Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk
The bulk TSF south and SCP embankments would have an upstream face liner (or low permeability core zone) connected to a grout curtain to contain seepage flow. The depth and lateral extent of the grout curtain would be confirmed during detailed design and ongoing site investigations (PLP 2018-RFI 006a).	Liner and grout curtain would keep contact groundwater from reaching the downgradient resources.	Mine Site	Construction/ Operations/ Closure	Groundwater Hydrology; Water and Sediment Quality; Geohazards and Seismic Conditions

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Excess water from the bulk and pyritic TSFs would be pumped to the main water management pond to reduce the potential for TSF failure or spills resulting from overtopping.	Reduction of pore water and maintenance of a safety buffer in TSF storage would reduce the risk of embankment failure and overtopping.	Mine Site	Operations/ Closure	Spill Risk
Treated water would be discharged through buried chambers designed to provide energy dissipation, erosion control, and freeze protection.	Minimizes impacts to streams from erosion and resuspension of suspended solids at the proposed discharge locations.	Mine Site	Operations/ Closure	Fish Values; Water and Sediment Quality
Settling ponds, bale check dams, and silt fences would be used to prevent sediment from reaching downstream waterbodies.	Use of sediment capture processes and measures would reduce the inflow of sediment to waterbodies, and reduce the effects on water quality and aquatic habitat.	Mine Site	Construction/ Operations	Water and Sediment Quality; Vegetation; Wetlands and Other Waters/Special Aquatic Site; Fish Values
The pyritic TSF liner would be protected from damage during waste rock placement by placing processed materials (sand and gravel) on top of the liner to minimize the risk of damage from equipment.	Placement of protective materials would reduce likelihood of liner damage and leakage to groundwater.	Mine Site	Operations	Water and Sediment Quality
Detailed characterization of quarry bedrock and open pit overburden materials, materials balance, and a pit pre-stripping plan would be completed during detailed design to confirm material availability and segregate different material types to be stockpiled for construction and closure. If required, additional rockfill materials would be sourced by lowering the base elevation of the quarries, and additional low permeability materials would be sourced from embankment foundation excavations, other mine site preparations, or deconstruction of certain facilities at closure (PLP 2018-RFI 015a, PLP 2019-RFI 129).	Site-specific evaluation of quarry and pit overburden material avoids the need for additional footprint for material sources, and would confirm that sufficient material is available and suitable to meet the specifications for embankment zones, liner bedding, and bulk TSF closure cover design that minimize the migration of contact water to the environment.	Mine Site	Construction/ Closure	Wetlands; Water and Sediment Quality; Groundwater Hydrology

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Underdrains would be constructed beneath the main WMP and pyritic TSF to achieve hydraulic containment of groundwater and promote seepage collection and drainage beneath the liner systems (Knight Piésold 2019c; PLP 2019-RFI 109e). The aggregate underdrains would be oversized to account for higher than expected seepage flows or potential cementation of the materials during the life of the facility (Knight Piésold 2019c; PLP 2019-RFI 109e).	Underdrains and hydraulic containment would minimize the likelihood of contaminant migration away from these facilities.	Mine Site	Operations/ Closure	Water and Sediment Quality; Groundwater Hydrology
Closure of the WMPs and pyritic TSF would include groundwater monitoring in the facility footprints after closure for contaminated water that may have leaked through the liners to shallow groundwater. If required, impacted groundwater would be collected in wells and sent to the pit lake (Knight Piésold 2018b) for as long as needed to meet applicable regulatory requirements.	Prevent impacts to groundwater quality.	Mine Site	Closure	Water and Sediment Quality
In the event of a tailings spill, a variety of remedial actions would be implemented to address health and safety concerns, such as recovery of spilled tailings, repair of erosion damage, downstream water quality monitoring, etc. (Knight Piésold 2018o, 2018p).	Reduce the long-term potential for TSS and sedimentation, ARD and ML from spilled tailings; and rehabilitate downstream areas.	Mine Site	Operations/ Closure	Water and Sediment Quality; Spill Risk; Fish Values
Groundwater levels surrounding the pit would be monitored throughout closure to determine if the control elevation would need to be adjusted to prevent groundwater outflow from the pit (Knight Piésold 2018n).	Maintaining groundwater gradient toward the pit to prevent the potential for migration of contaminated groundwater out of the mine site.	Mine Site	Operations/ Closure	Water and Sediment Quality
Groundwater levels would be monitored during operations in piezometers along the ridge and downstream of the bulk TSF embankment, and operational rules established to maintain hydraulic containment. If seepage through the ridge is detected, contingencies such as relief wells and/or seepage recovery wells would be implemented (Knight Piésold 2018n).	Monitoring would confirm hydraulic containment beneath the bulk TSF and allow adaptive management if groundwater levels indicate potential loss of hydraulic containment at the bulk TSF.	Mine Site	Operations/ Closure	Water and Sediment Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
During detailed design of WTPs, additional process water and mass balance modeling, heat transfer engineering, and pilot plant test work would be performed to provide updates to water quality predictions in support of APDES permitting (PLP 2019-RFI 021h).	Additional modeling and pilot plant testing would further evaluate the feasibility of WTP processes, assess maintenance requirements, reduce uncertainties, and refine discharge water quality predictions.	Mine Site	Design/ Operations	Water and Sediment Quality, Fish Values
Several adaptive management strategies would be employed in the design and operations of the WTPs: sizing with more hydraulic capacity than the predicted maximum inflows; having a backup treatment train at each WTP; monitoring to identify influent conditions that could trigger additional treatment capacity; adding iron to WTP sludge disposed in the pyritic TSF to prevent selenium redissolution; and installation of additional trains and WTP building expansion if needed (PLP 2019-RFI 021e, HDR 2019g).	Adaptive management strategies reduce the likelihood of WTP discharges not meeting water quality standards and minimize the buildup of excess recirculated WTP waters that do not meet standards in onsite storage facilities.	Mine Site	Design/ Operations/ Closure	Water and Sediment Quality, Fish Values
The project would not have a secondary gold recovery plant that utilizes cyanide, thereby eliminating the need to use cyanide on the project.	Elimination of cyanide from the mining process eliminates the potential for the release of cyanide to the environment, either from spills during transportation or from residual cyanide in tailings/contact water.	Mine Site/ Transportation Corridor	Operations	Health and Safety; Water and Sediment Quality; Spill Risk; Fish Values
The design of the lake ferry (relative to using standard tug/barge) significantly reduces the risk of grounding or sinking, thereby reducing the risk of any kind of spill.	Reduces the potential for and magnitude of potential releases to Iliamna Lake.	Transportation Corridor	Operations	Spill Risk
Use of diesel electric propulsion for the ferry reduces noise impacts and air emissions.	Use of a diesel electric propulsion system would reduce the noise output and air emissions.	Transportation Corridor	Operations	Noise; Air Quality

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The project would work with communities (and supply funding) to provide for the marking and maintenance of snowmachine trails between communities across Iliamna Lake when lake ice is thick enough to support such traffic.	Marked and maintained snowmachine trails provide a safe route for local residents when traveling to other communities or to reach subsistence areas.	Transportation Corridor	Operations	Subsistence; Environmental Justice; Transportation and Navigation
PLP would signpost and maintain road crossings for all terrain vehicles (ATV) or snowmachine use wherever the access road intersects existing trails.	The crossings would be marked and maintained to avoid impacting the ongoing use of existing trails used by ATVs and snowmachines	Transportation Corridor	Operations	Transportation and Navigation
PLP would work with the State of Alaska and LPB to address road improvement and maintenance costs arising from PLP's use of the existing section of road between the Newhalen/Iliamna airport and the PLP constructed mine access road.	Project use of the existing road north of the Newhalen/Iliamna airport may require road upgrades and additional road maintenance. The road is currently maintained by the State of Alaska and this measure would avoid additional costs accruing to the State from PLP's use of the road.	Transportation Corridor		Transportation and Navigation
Fuel delivery barges would be double-hulled to reduce spill risk.	Double-hulled barges reduce the frequency of oil spills and the quantity of oil released.	Transportation Corridor/Port	Construction/ Operations/ Closure	Spill Risk
All project-related vessel traffic would be restricted to 10 knots or less when west of the vertical line 153°15'0" W (Kamishak Bay) to minimize the potential for impacts with marine wildlife.	Controlled speeds reduce the potential for strikes.	Transportation Corridor/Port	Construction/ Operations/ Closure	Threatened and Endangered Species

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Stability analyses for the caisson dock and trestle would be completed prior to final design and include additional geotechnical investigation; further evaluation of the Bruin Bay fault to refine ground shaking estimates, liquification assessment, and analysis of seismic loading; bearing capacity; settlement; and sliding resistance. The additional analyses would be conducted in accordance with accepted industry standards/codes and subject to independent review (Knight Piésold 2019d; PLP 2020-RFI 160).	Stability analyses would minimize damage to the port structures from major earthquakes and ice/wind/wave loading. Additional studies would confirm maximum ground shaking estimates and seismic loading to be incorporated into port design, which would minimize damage to facilities and spill risk in the event of a major earthquake.	Port	Construction/ Operations/ Closure	Geohazards and Seismic Conditions; Spill Risk; Surface Water Hydrology
The elevation of the port terminal and dock was raised to +40 feet Mean Lower Low Water (MLLW) to account for tsunami runup. The elevation would be revisited in final design based on site-specific analysis of maximum tsunamis from earthquake and volcanic debris flow sources. The concrete containment barrier wall around the fuel tank farm would be designed to protect against maximum tsunami run-up (PLP 2019b, 2019-RFI 112, 112a).	Structures would be designed to be above the maximum tsunami elevation and/or withstand tsunami forces, resist uplift and scour, and protect against debris impacts and fuel spills.	Port	Construction/ Operations	Geohazards and Seismic Conditions; Water and Sediment Quality; Spill Risk
Operational measures would be employed to protect personnel in the event of a tsunami, such as early warning systems, vertical evacuation structures, and operational procedures and training on when to move to higher ground and secure critical equipment (PLP 2019-RFI 112).	Safety risk to personnel in the event of a tsunami would be reduced.	Port	Geohazards,	Geohazards and Seismic Conditions; Health and Safety
Operational procedures would be in place for vessels to cease lightering operations and move to safer locations in deeper water if a tsunami warning is issued or volcanic debris flow activity is predicted (PLP 2019-RFI 112).	Procedures would reduce the risk of spills and safety impacts on lightering and ore cargo vessels in the event of a tsunami or volcanic activity.	Port	Operations	Geohazards and Seismic Conditions; Spill Risk; Water and Sediment Quality; Health and Safety

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Lightering of concentrate at Amakdedori port eliminates the need for dredging a deep-water channel.	Would reduce benthic habitat disturbance and prevent increased turbidity from dredging. Would also eliminate the need to construct an onshore dredged material stockpile.	Port	Construction	Water and Sediment Quality
Shore power would be provided for vessels that are docked at the Amakdedori port.	Providing natural gas generated shore power to vessels while they are in port, rather than having the vessels idle, would reduce NO_x (oxides of nitrogen) at the port.	Port	Operations	Air Quality
Coarse granular road base construction materials would be used and additional culverts installed, where technically feasible, to facilitate the flow of water through segmented wetlands impacted by project road construction (PLP 2019-RFI 071b).	Allows for the flow of water through wetlands segmented by road construction, minimizing overall impacts, and minimizing changes to the structure and function of the aquatic ecosystem.	Transportation Corridor	Construction	Wetlands and Other Waters/Special Aquatic Sites
The road includes crossing rivers at a right angle where feasible to minimize impacts in the riparian areas.	Crossing rivers at right angles reduces wetlands, vegetation, and stream impacts and reduces erosion potential.	Transportation Corridor	Construction	Vegetation; Wetlands and Other Waters/Special Aquatic Sites
Culverts and bridges would be designed to optimize fish passage, and the project would use BMPs for design, construction, and maintenance.	Designing culverts and bridges at fish-bearing streams to optimize fish passage would minimize impacts on fish and fish habitat.	Transportation Corridor	Construction	Fish Values

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Material sites for the transportation and natural gas pipeline corridor would be sampled for ARD and metal leaching potential prior to development during detailed design. Material sites that have the potential for ARD or metal leaching would not be used. Fill materials from the sites used in construction would contain negligible sulfide minerals, be NAG, and contain trace element contents at levels comparable to globally typical values for unmineralized rock. PLP's approach to selecting rock, achieving the objective of meeting water quality criteria for metals and other parameters without the need to treat runoff in perpetuity, is to test the rock prior to construction to confirm sulfur and element characteristics.	The confirmation and use of NAG and non-metal-leaching material in construction would reduce the risk of impacts to water and sediment quality.	Transportation Corridor/ Natural Gas Pipeline	Construction	Water and Sediment Quality
Use of a ferry to cross Iliamna Lake reduces the road length and associated wetlands impacts and other impacts.	Reducing the total access road length would minimize wetlands and vegetation impacts relative to a longer access road around Iliamna Lake.	Transportation Corridor	Construction/ Operations/ Closure	Vegetation; Wetlands and Other Waters/Special Aquatic Sites
Road connections to communities enhance opportunities for local employment while residing at home.	Road connections to communities allow residents to gain employment with the project without relocating. This helps reduce the amount of outmigration in the region.	Transportation Corridor	Construction/ Operations/ Closure	Needs and Welfare of the People—Socioeconomics; Environmental Justice
Road connections to communities enable the use of existing airport facilities, eliminating the need to construct and operate parallel facilities.	Reduces wetlands and vegetation impacts from constructing additional airports.	Transportation Corridor	Construction/ Operations/ Closure	Transportation and Navigation; Vegetation; Wetlands and Other Waters/Special Aquatic Sites
Road and ferry terminals are sited to avoid private (non-ANCSA) lands, environmentally sensitive areas, archaeological resources, and areas of known high subsistence use.	Careful siting of project features can be used to avoid impacts to environmentally sensitive areas, archaeological resources, and areas of known high subsistence use.	Transportation Corridor	Construction/ Operations/ Closure	Cultural Resources; Subsistence; Land Ownership, Management, and Use; Environmental Justice

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
Use of closed containers to transport concentrate reduces spill potential while trucking, barging, loading, and on the ferry, and eliminates the potential for concentrate dust.	Reduces the potential for elevated metals in soils along the transportation corridor.	Transportation Corridor	Operations	Spill Risk; Air Quality
All reagents would be shipped in their original, approved-for-shipping containers. These original containers would be placed inside steel shipping containers at the factory or consolidation terminal and shipped to the mine site prior to unloading from the steel shipping containers.	Eliminates the potential for the release of reagents to the environment from spills during transportation.	Transportation Corridor	Construction/ Operations/ Closure	Spill Risk; Transportation and Navigation
The use of fuel isotainers to transport diesel fill reduces spill potential while trucking and on the ferry.	Reduces the potential for diesel spills.	Transportation Corridor	Operations	Spill Risk; Transportation and Navigation
The implementation of wildlife safety measures along the transportation corridor to influence animal behavior and minimize human-wildlife interactions includes: • Any wildlife injuries or mortalities would be immediately reported as appropriate. The carcasses of any road-killed animals would be removed and disposed of in a timely manner so that they do not serve as an attractant to bears or other wildlife. • Vegetation along the right of way would be managed (trimming of shrubs and trees) to reduce attractiveness for large mammals by reducing browsing quality.	Reduces the probability of wildlife being struck by vehicles.	Transportation Corridor	Construction/ Operations/ Closure	Wildlife Values
Ferry bilge water would be collected in holding tanks at the ferry terminals and transported to one of the water treatment plants located at the mine site or Amakdedori port.	Collection and transport of the bilge water to treatment plants at the mine site or port avoids discharge to Iliamna Lake, as previously proposed.	Transportation Corridor	Construction/ Operations/ Closure	Water and Sediment Quality; Fish Values
Co-location of the road and pipelines (natural gas, concentrate, return water) reduces wetlands and other impacts and removes the need for a separate corridor.	Co-location of project facilities reduces the overall footprint and minimizes impacts to wetlands and vegetation.	Transportation Corridor/Natural Gas Pipeline	Construction/ Operations	Vegetation; Wetlands and Other Waters/Special Aquatic Sites

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The road/pipeline alignment and material sites were designed to minimize impacts to wetlands.	Siting the road/pipeline alignment to minimize fill in wetlands minimizes the overall project impact on wetlands.	Transportation Corridor/Natural Gas Pipeline	Construction/ Operations	Wetlands and Other Waters/Special Aquatic Sites
Pipelines would be attached to bridge crossings, removing the need for horizontal directional drilling (HDD) under major river crossings, removing the potential for frac-out.	Reduction in the number of required HDD crossings would reduce the potential for frac-out and associated water and sediment quality impacts.	Transportation Corridor/Natural Gas Pipeline	Construction	Surface Water Hydrology; Fish Values; Water and Sediment Quality
Detailed HDD plans would be developed during detailed design for all HDDs that are required, and would be in place prior to construction commencement. The HDD plans would ensure that all HDD work is done in compliance with applicable regulations, and would outline measures to be undertaken to avoid the potential for a frac-out, and measures to respond to a frac-out should one occur.	Carefully managed HDD activities would reduce the potential for impacts to water and sediment quality and existing water supply wells.	Transportation Corridor/Natural Gas Pipeline	Construction	Surface Water Hydrology; Groundwater Hydrology; Fish Values; Water and Sediment Quality
Water used for hydrostatic testing of pipelines would be obtained from and discharged back to sources local to the section of pipeline being tested, thereby minimizing the potential for the mobilization of invasive species.	Limiting movement of water to localized areas would reduce the potential for transportation of invasive species.	Transportation Corridor/Natural Gas Pipeline	Construction	Water and Sediment Quality; Vegetation; Wetlands and Other Waters/Special Aquatic Sites
The natural gas pipeline would use HDD to access deep water from the compressor station area to avoid shoreline impacts from trenching on the Kenai Peninsula.	Use of HDD to construct the portion of natural gas pipeline from onshore Kenai Peninsula to deep water in Cook Inlet would reduce the potential for erosion or other shoreline impacts.	Natural Gas Pipeline	Construction	Soils; Geohazards and Seismic Conditions
Additional engineering analyses would be conducted during pipeline detailed design to further evaluate effects and potential mitigation plans for geohazards such as ground shaking, liquefaction, volcano debris flows, tsunamis, shallow bedrock, and scour (NanaWP and IntecSea 2019a).	The additional analyses and design would minimize potential damage to the pipeline from earthquakes and other geohazards.	Natural Gas Pipeline	Construction/ Operations	Geohazards and Seismic Conditions; Spill Risk

Table 5-2: Applicant's Proposed Avoidance and Minimization Incorporated into the Project

Description of Measure	Description of Impact Being Mitigated	Project Component(s)	Project Phase(s)	Primary Resource(s) Affected
The natural gas pipeline would be equipped with a leak detection system. In the event of a gas release, shut-off valves would be closed to limit the extent of the release. An automatic shut-off system would be installed on the east side of Cook Inlet, near the compressor station. On the west side of the Inlet, at the port site, either an automatic or manual shut-off system would be installed. Port personnel would always be on site and able to respond with manual shut-off if needed.	Reduces duration of natural gas release from potential failure of pipeline.	Natural Gas Pipeline	Operations/ Closure (if pipeline remains operational)	Water and Sediment Quality; Spill Risk; Fish Values